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EPIDEMIOLOGICAL AND ECONOMIC LOSSES OF ROAD TRAFFIC FATALITIES: INDIA'S PICTURE

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ABSTRACT
Road Traffic Accidents are one of the leading causes of mortality and morbidity among young adults and economically productive age groups. Their burden is markedly higher in the developing world within which India shoulders for a high burden. The current study using secondary data from NBRC attempts to quantify the potential years of life lost, and possible economic losses of because of Road traffic fatalities in India. A total of 169077 fatalities occurred in 2014 with 85.5% of them being among males and 14.5% among females. The Median number of fatalities per state is 2955, with a range of 0-20653 with lakshwadeep in lower extreme and Uttar Pradesh in higher extreme. The estimated potential years of life lost in 2014 because of road traffic fatalities stood at 4.3 million potential life years, whose economic burden amounted to over 6 billion USD. The study reflects the burden of potential losses the country had incurred in 2014, and calls for reiteration of focus on preventing road traffic accidents as one of the key issues among the larger public health policies within the country.

KEYWORDS: Road Traffic Accidents, Potential Years of Life Lost, Ecological Studies, Economic Burden.

INTRODUCTION
An Accident often termed as an unintentional injury, occurs without the prior information to the victim resulting in damage, harm or death. The accidents could be of several types ranging from those of road traffic accidents, burns, accidental drowning, accidents because of harmful plants and animals etc.[1] Though majority of the times intentional self harm is intentional and doesnot fit in to the standard definition of accident being the unintentional injury/harm, it could be well argued that the circumstances leading to intentional self-harm are most of the times unintentional and unavoidable, making it an accident form that perspective. Such a kind of arguments invariably exist. However, from the perspective of health accident is a loaded term resulting in substantial amount of mortality and morbidity in almost all the countries in the world.

Within Accidents themselves, Road traffic accidents (RTA) account for the majority of mortality and morbidity claiming over 1.25 million lives each year and an average of 35 million non-fatal injuries.[2,3] Majority of these deaths occur in low and middle income countries, owing to the resource constrained situations, poor enforcement of legislations, meagre infrastructure and weak health systems. While the high income countries of Europe and North America brought down the road traffic fatalities, a considerable increase was observed among their low income counterparts in Asia and Africa.[4] Studies indicate more than a fivefold increase in road traffic fatalities in developing countries than in the developed world, even though the developed world had high vehicle to population density.[5]

Moreover, majority of these injuries and deaths are among the younger age group of 15 to 44 years, accounting for over 3% of GDP loss for developing economies.[2] Given that majority of the deaths because of road traffic accidents occur in the younger age groups, potential years of life lost, becomes the epidemiological measure of choice.

The potential years of life lost (PYLL) is one of the important components in calculating disability adjusted life years (DALY). PYLL estimates the possible number of years an individual might have lived if he does not die prematurely[6], making it considerably relevant in the debates pertaining to road traffic accidents. Additionally, potential years of life lost also presents the researchers with the opportunity to estimate the economic losses involved.[7]

Within the Indian context, though the country accounts for more than 0.1 million deaths because of RTA, a trend which has been consistent from over a decade; there is lesser importance given to it. Owing to the costs

involved, majority of the studies on road traffic accidents are centered within the smaller geographical area[8-12], limiting their large scale implication. Additionally, trivial number of studies were actually capturing the potential years of life lost and the economic losses associated with it. Given the above context the current study aims to fill this gap by estimating the PYLL because of road traffic fatalities in India in 2014.

OBJECTIVES

1)To estimate the potential years of life lost because of Road Traffic Accidents in India for the year 2014
2)To estimate the potential economic loss because of road traffic accidents.

METHODOLOGY

Study Design: The study draws on the analysis of secondary data on road traffic accidents for the year 2014. Given that the study focusses on estimating the PYLL, at one single point of time over a large geographical region; it assumes the characteristics of Ecological study design. Adoption of this study design is supported by similar study conducted elsewhere on HIV/AIDS.[13]

Data

The data on the deaths because of road traffic accidents is released every year by National Crime Records Bureau (NCRB). The data is available in the public domain and is one of the most authentic data on the reported cases of road traffic accidents, thereby minimizing the possible miscalculations.

Data Analysis: Given the objective of the study is to estimate the potential years of life lost (PYLL), the current study adapts a step by step procedure. A similar kind of an approach in calculating PYLL was followed elsewhere.[14] The data analysis was preceded by construction of a four step data analysis map which was given in figure 1. Microsoft excel 2013 was used for necessary calculations in the data analysis and data storage.

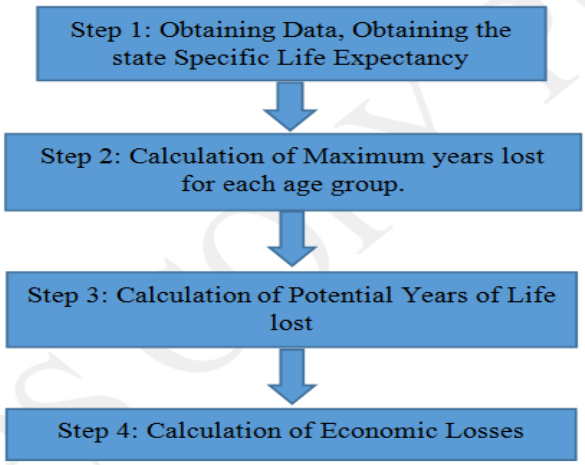


Figure 1. Figure Showing the Step wise Data Analysis Plan

The potential years of life lost is calculated by applying the formula.[6]

PYLL = Reference age* – Mean age at Death# x Number of deaths
(* => The reference Age is state specific life expectancy; # => Mean age at death = Average of Highest and lowest values in the age group range)

The economic losses are calculated by using the following equation
Economic Loss = PYLL * Precapita Income for the year 2014

Ethical Consideration: Given that the study relies on secondary data analysis it has minimal ethical implications. The data was freely accessible in the public domain which further brings down ethical considerations around it.

RESULTS

As per the data, overall a total of 169077 fatalities occurred in 2014 because of road traffic accidents in the country. Of these over 85.5% (144725) were among males, whereas around 14.5% (24352) are among females. Within states, Uttar Pradesh, Maharashtra and Tamilnadu occupy the first three positions with 20653, 18574 and 17053 road traffic fatalities, whereas Nagaland, Daman and Dau and Lakshadweep occupy last three positions with 32, 15 and 0 road traffic fatalities respectively. The median for the distribution of RTA across the states stood at 2955 fatalities, a number which was for the state of Jharkhand. Concerning the Age related distribution of the road traffic fatalities which is represented in table 1, the age groups 30-45 years, and 18-30 years has the highest number of RTA, accounting for over 32% (54260) and 31.5% (53827) of the total RTA. Concerning the potential years of life lost, there was a total loss of over 4.53 million life years, of which males accounted for over 83.8% (3804369) and females accounted for over 16.2% (731491.5). Age group 18-30 years account for the largest share (48%) of PYLL, whereas the age group 60 years and above accounted for around 1% (66488.8) of PYLL. The economic loss because of road traffic accidents was calculated by multiplying the PYLL with percapita income for the year 2014. The projected economic loss accounted to over four hundred billion Indian rupees i.e., over 6 Billion USD. Of these, the states of Uttar Pradesh, Maharashtra and Tamilnadu account for a cumulative loss of over 32%. Majority of the states fall under the category of higher economic losses (>100 million USD), with Small states, Union Territories and north-eastern states, falling under the categories with lesser economic losses (> 1 Million - 100 Million USD). The detailed visualization of PYLL and Economic Losses is given in Map 1 and Map 2.

DISCUSSION

Defined as a "collision involving one or more moving vehicles and individuals", road traffic accidents account for over 1.3 million deaths annually, making them 4th leading cause of deaths worldwide.[11] Over 90% of the road traffic fatalities occur in low and middle income countries, with India holding a considerable share. With WHO`s projection that the road traffic accidents will escalate to sixth leading cause of mortality by 2020[10, 15], it becomes important to understand the epidemiological and economic burden of road traffic accidents which is the focus of this particular research paper.

Internationally, road traffic fatalities had a higher prevalence among males than their female counter parts. Even among the most prevalent social and economic groups this higher rates among males were consistent.[5, 8] From table 1 it could be said that they are around 0.17 million deaths which are attributed to road traffic accidents in 2014, a steep increase of 18% from an approximate of 0.14 million RTA fatalities reported in 2011.[11] While Tamilnadu was leading in terms of RTA in 2011, its position slightly tilted by 2014 with the state of Uttar Pradesh leading, followed by Maharashtra and then Tamilnadu. However, these three states showed a similar trend over time.[11] The increased density of vehicles particularly in these states could be deemed as a possible reason for higher RTA Prevalence. Studies even reflected the same where the increase in vehicular density is consistent increase with prevalence of road traffic fatalities particularly in developing countries.[16] Moreover several studies reported the increasing prevalence of road traffic accidents, in India in general and south India in specific.[8-10, 12]

With respect to the age of the individuals, it was observed that the age groups between 18-60 years had the highest prevalence of road traffic accidents, with a higher prevalence among age groups 18-30 years and 30-45 years accounting for over 2/3rds of the total RTA fatalities. This is consistent with the studies across the developing world.[5] Given such a higher prevalence of RTA among the lesser age groups Potential Years of Life Lost becomes an important measure to consider. However, Concerning the potential years of life lost because of RTA, there are little number of studies concerning it particularly in the Indian context. Comparing the tables 1 and 2 it could said that the fatalities and the potential years of life lost in the age groups 18-30 years, 30-45 years and 45-60 years are consistent with each other. However, an interesting observation could be made where the difference between the higher and lesser age groups seem to be lessened owing to the fact that PYLL gives more importance to the potential years lost in lesser age groups. From map 1 a brief picture of potential years lost in each state could be elucidated which is consistent with road traffic fatalities in the respective states. Adding the economic dimension gives the further detailed picture which is presented in map 2. Map 2 gives a much greater detail, presenting a grim picture with majority of the states losing more than 100 million USD because of RTA alone. The sates with the lesser economic losses they are probably those with lesser motor vehicle to population index, difficult geographical terrain and lesser population (such as north eastern states and union territories). Such lesser RTA and costs owing to it are consistent in these geographical regions. However, in the recent decades there has been a steady increase marking the need to tackle RTA in these regions too.

This grater amount of burden generally goes unnoticed. It is primarily because majority of the times the studies which attempt to project the burden of the disease and economic losses because of RTA primarily reflect on the direct costs of hospitalization and indirect costs of other economic losses[17, 18], but don't project the PYLL and losses associated with RTA. Though a sincere attempt had been made in developing the WHO's global burden of the disease architecture, taking in to consideration the DALYs in which PYLL is a component[15], its relevance has been compromised to the contemporary time scale. The greater number of deaths among the age group 18-60 years also projects its influence on an important component of dependency ratio; which is defined as the ratio between the proportion of population in economically productive age group and economically non-productive age group.[19] With a projected increase to over 0.2 million deaths in the years to come and with over 2/3rds of them being in the economically productive age group i.e., 18- 60 years; it could be said that the dependency ratio might be tilted towards negative horizon.

The study discusses the epidemiological and economic importance of RTA which are a neglected epidemic in majority of low and middle income countries. Though there has been voices raising demanding for their prevention and control[20], the road traffic fatalities had shown a considerable increase over the decades.[4] The growing number of motor vehicles, alcoholism, poor enforcement and compliance with traffic regulations, and lack of and poor maintenance of roads could be considered as some of the important reasons.[4, 5]

Additionally specific to the health system; poor access to trauma care services, and poor health infrastructure to manage road traffic emergencies could be considered as imperative reasons, subsiding the competency of health systems in providing essential emergency care within the "Golden Hour".

Within the Indian context, based on the historical trend of poor investment in road safety with respect to GDP in the country, Kopits and Cropper projected a non-declining trend in road traffic accidents in the country till 2042.[21] Given the presented losses, the projections present a grave picture of the losses the country has to incur if not the adequate measures are initiated and strengthened on a war foot.

CONCLUSION

Road Traffic Accidents are growing epidemic and are projected to cost over 1.5 million deaths by 2020 in LMICS alone. Deriving from NCRB's road traffic deaths data, this study gives a greater picture of road traffic fatalities; by ascribing potential years of life lost and projected economic losses associated with it, it is more than just the number of lives lost. Even considering the same from the perspective of the dependency ratio, it could be said that the influence of road traffic fatalities is staggering. The high losses as presented in this article represent the opportunities lost by the individual states and the nation, thereby reflects the need to enforce the required regulations and empower the individuals and populations to prevent RTA.

Limitations: The current study shoulders the majority of the limitations of secondary data analysis. Firstly, the data what was obtained was from NBRC, which primarily compiles the data from the reported cases of RTA, this could result in missing out of few cases and thereby underestimation of deaths. The primary results of the study i.e., PYLL and The Economic losses because of Road Traffic Fatalities were calculated using measures such as Life Expectancy and Percapita Income respectively, which are highly dynamic in nature. Given the fact that the Life expectancy and percapita income are historically in an upward spiking curve, it should be kept in observance that these epidemiological and Economical losses are minimum and might even increase. However, keeping aside the limitations the study gives a clear picture of the epidemiological and economic losses attributable to road traffic accidents in India.

Conflict of Interest: None Declared.

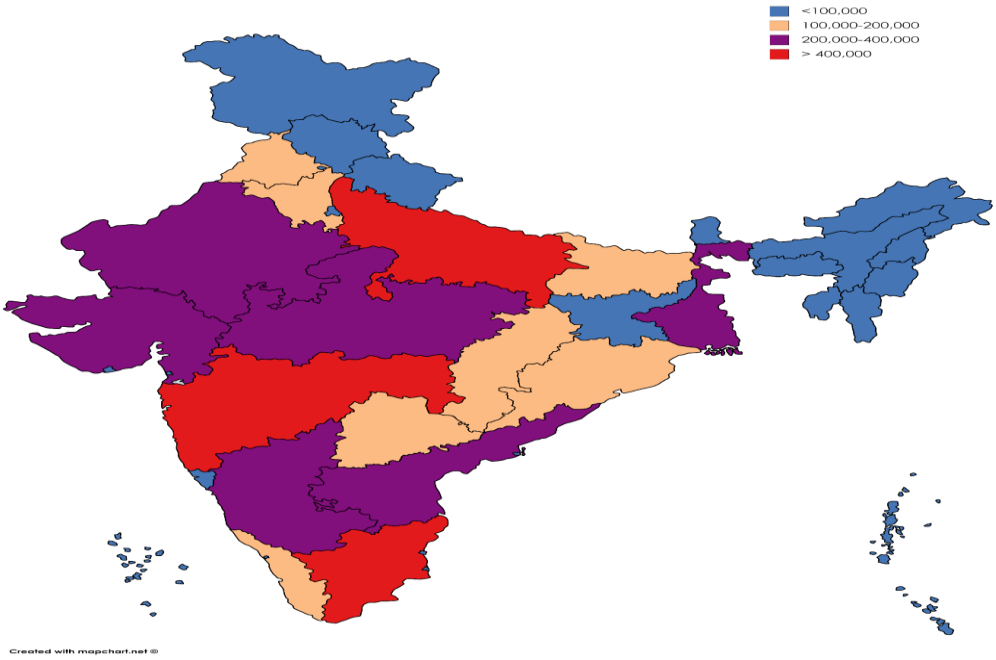
Tables and Maps

Table 1. Table showing deaths of RTA among males and females across age-groups

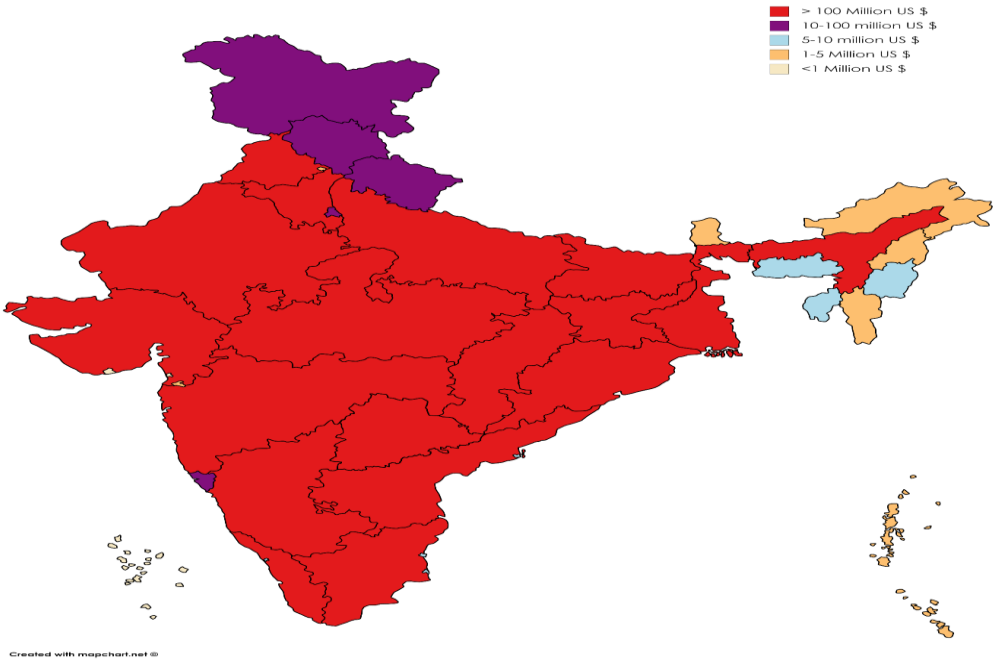
Category	Age Group						Total
	Below 14 Years	14 – 18 Years	18 – 30 Years	30 – 45 Years	45 – 60 Years	60 Years	
Males	4428	10469	47127	47099	26247	9355	144725
Females	1434	2251	6700	7161	4474	2332	24352
Total	5862	12720	53827	54260	30721	11687	169077

Table 2. Table showing distribution of PYLL among males and females across age-groups

Category	Age Group						Total
	Below 14 Years	14 – 18 Years	18 – 30 Years	30 – 45 Years	45 – 60 Years	60 Years	
Males	255792.3	508345	1926113	727510.1	333805.1	52803.7	3804369
Females	82849.2	109743.9	272015.4	196269.4	56928.5	13685.1	731491.5
Total	338641.5	618088.9	2198128	923779.5	390733.6	66488.8	4535860



Map 1. Map Presenting the PYLL Because of Road Traffic Fatalities in 2014



Map 2. Map Presenting the Economic Losses Because of Road Traffic Fatalities in 2014

Total Projected Economic Loss: Six billion, two hundred thirty-six million, five hundred seventy-eight thousand USD (as per 2014 dollar value).

REFERENCES

1. Hansen, H.L. and G. Pedersen, Influence of occupational accidents and deaths related to lifestyle on mortality among merchant seafarers. International journal of epidemiology, 1996; 25(6): 1237-1243.
2. WHO, Road Traffic Injuries. 2016, World Health Orgaization.
3. Gururaj, G., Injuries in India: A national perspective. Background Papers: Burden of Disease in India Equitable Development-Healthy Future. New Delhi: National Commission on Macroeconomics and Health, Ministry of Health & Family Welfare, Government of India, 2005; 325-347.
4. Nantulya, V.M. and M.R. Reich, The neglected epidemic: road traffic injuries in developing countries. BMJ: British Medical Journal, 2002; 324(7346): 1139.
5. Odero, W., P. Garner, and A. Zwi, Road traffic injuries in developing countries: a comprehensive review of epidemiological studies. Tropical Medicine & International Health, 1997; 2(5): 445-460.
6. APHEO, Calculating Potential Years of Life Lost. 2006, Association of Public Health Epidemiologists in Ontario: Canada.
7. Gardner, J.W. and J.S. Sanborn, Years of Potential Life Lost (YPLL)-What Does it Measure? Epidemiology, 1990; 1(4): 322-329.
8. Jha, N., et al., Epidemiological study of road traffic accident cases: A study from South India. Indian J Community Med, 2004; 29(1): 20-4.
9. Kanchan, T., et al., Analysis of fatal road traffic accidents in a coastal township of South India. Journal of forensic and legal medicine, 2012; 19(8): 448-451.
10. Kumar, A., et al., Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five years. The Indian Journal of Neurotrauma, 2008; 5(2): 63-67.
11. Ruikar, M., National statistics of road traffic accidents in India. Journal of Orthopedics, Traumatology and Rehabilitation, 2013; 6(1): 1.
12. Bayan, P., et al., Profile of non-fatal injuries due to road traffic accidents from a industrial town in India. International journal of critical illness and injury science, 2013; 3(1): 8.
13. SILVA, J.D., et al., Morbidity and mortality due to AIDS: a study of burden of disease at a municipal level. Revista do Instituto de Medicina Tropical de São Paulo, 2015; 57(5): 407-411.
14. Kodali, P.B., Whose loss and whose responsibility? An economic view point of understanding potential economic losses of farmer suicides in India. International Journal of Academic Research 2017; 4(1 (2).
15. Mathers, C., The global burden of disease: 2004 update. 2008: World Health Organization.
16. Garg, N. and A.A. Hyder, Exploring the relationship between development and road traffic injuries: a case study from India. The European Journal of Public Health, 2006; 16(5): 487-491.
17. Gururaj, G., Road traffic deaths, injuries and disabilities in India: current scenario. The National medical journal of India, 2008; 21(1): 14-20.

18. Mohan, D. Social cost of road traffic crashes in India. in Proceedings First Safe Community Conference on Cost of Injury. Viborg, Denmark. 2002.
19. Cohen, J.E., Human population: the next half century. science, 2003; 302(5648): 1172-1175.
20. Peden, M., et al., World report on road traffic injury prevention. 2004, World Health Organization: Geneva.
21. Kopits, E. and M. Cropper, Traffic fatalities and economic growth. Accident Analysis & Prevention, 2005; 37(1): 169-178.